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Technical Note N-611

CHEMICAL CLEANING MATERIALS AND PROCESSES  
FOR BUDOCKS REQUIREMENTS

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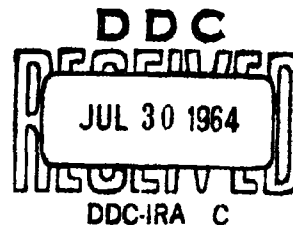
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BY

C. Saturnino and W. R. Nehlsen

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U. S. NAVAL CIVIL ENGINEERING LABORATORY  
Port Hueneme, California



CHEMICAL CLEANING MATERIALS AND PROCESSES FOR  
BUDOCKS REQUIREMENTS

Y-R007-08-05-907

Type B

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ABSTRACT

This technical note contains information on chemical cleaning materials and methods obtained from Government and commercial practice to improve the Naval Shore Establishment cleaning program. Current Bureau of Yards and Docks field cleaning practices are outlined and compared with the current technologies in this field.

It is concluded that improvements in field activities' cleaning practices can be achieved by further studies of detergent-sanitizers and alkaline spray cleaning. It is recommended that expanded BUDOCKS manuals on sanitary cleaning and on chemical cleaning be prepared, and that a continuing program of collection and dissemination of information be established in conjunction with an existing Government laboratory engaged in cleaning research.

## INTRODUCTION

The purpose of this note is to report the findings of a study conducted to determine if new chemical cleaners and methods are available that can be used to improve the effectiveness and reduce the cost of chemical cleaning under Bureau of Yards and Docks responsibility. This work has been performed under Task Y-R007-08-05-907, Chemical Cleaning Materials and Processes, which has the general objective of providing technical information on current cleaning methods for the Naval shore facilities.

This study has been made by reviewing published reports, collecting information on current practices at several Naval stations, and compiling data from Federal Supply catalogs, commercial and industrial suppliers, and other Government agencies.

The task instructions designated the following five categories for application:

1. Sanitary cleaning.
2. Paint stripping for wood and metal.
3. Steam cleaning for interiors and exteriors of wood and masonry buildings and equipment.
4. Metal cleaning compounds for degreasing, scale and rust removal, etc.
5. Cleaning prior to painting or repainting.

The study of sanitary cleaners has previously been published as Technical Note N-580.<sup>1</sup> It will be summarized later in this report, which consolidates the results of all phases of the study. Information on the other four categories will be detailed in subsections of this note, with discussion of results, conclusions, and recommendations for all subsections in the final portion of the note.

Table I lists a number of Government agencies that were found to be concerned with chemical cleaners or cleaner specifications. Most of the organizations were contacted in the course of the investigation. Table II lists commercial chemical cleaning firms that market extensive lines of

cleaning products. Published information from these companies and from technical journals was used in determining established and newly developed chemical cleaning techniques for comparison to existing BUDOCKS techniques and specifications.

Although no single BUDOCKS publication was found to contain extensive information on chemical cleaning, NAVDOCKS TP-PW-30,<sup>2</sup> NAVDOCKS MO-110,<sup>3</sup> and MO-125<sup>4</sup> were found to present fairly comprehensive information on chemical cleaning for most BUDOCKS applications. NAVEXOS P-938,<sup>5</sup> a general Navy publication covering packaging and preservation, NAVSHIPS 250-342-1,<sup>6</sup> and NAVWEPS 07-1-503<sup>7</sup> also deal extensively with cleaning practices. The information in these manuals and the practices at local stations are considered to be typical of Navy practice.

#### PAINT STRIPPING

The chemical materials used for paint stripping can be classified in two groups: alkaline and organic solvents. The alkaline strippers consist of caustic soda and sodium salts dissolved in water. Typical formulations of this group consist of caustic soda in 20 to 25 percent water solutions used to remove paint from ferrous metals; caustic soda in concentrations of 4 to 5 percent in water solutions is used to remove paint from wood and all metals, excepting aluminum, zinc, magnesium, and lead. Paint, varnish, and lacquer coatings are stripped from aluminum and aluminum alloy surfaces with formulations containing sodium metasilicate, sodium trisilicate, and sodium resinate. For tall, vertical surfaces, alkaline paint strippers are sometimes used in paste form. Organic solvents are used where alkaline strippers do not give satisfactory results.

Organic solvents are used to remove paint not alkali-removable, and for surfaces not alkali-resistant. For simple paint removal jobs, the paint stripper may consist of denatured alcohol, acetone, etc. Mixed organic solvents are used for more complicated work. Typical formulations for this group of strippers consist of benzol, denatured alcohol, and acetone. Another typical formulation consists mainly of methylene chloride, trichloroethylene, ethylene dichloride, and ethyl cellulose or cellulose acetate.

Alkaline paint strippers can be applied hot or cold, by brush, spray, immersion, flow-on, or steam gun (see Steam Cleaning section). Organic solvents are generally applied cold by brush, spray, flow-on, and immersion. Hot (170 F) organic solvents are sometimes used in the immersion method. NAVSHIPS 250-342-1 and NAVWEPS 07-1-503 describe very well step-by-step paint stripping methods recommended for ferrous and non-ferrous metals, and wood.

Table III lists twenty strippers listed in the Navy manuals previously noted (References 2-7), or in the GSA-FSS<sup>8</sup> stock catalog. In addition to these, some compounds, such as methyl-ethyl-ketone and lacquer thinner are suggested for various relatively simple paint removal tasks.

A review of the various products of the commercial companies listed indicated no significant differences in the strippers available and methods to use as compared to Navy methods.

The inherent problems in paint stripping are hazardous materials, inefficiency of small jobs, and capital expense for large job equipment. Information from the general literature and various companies has given no indication of significant advances in overcoming these problems. The continuing development of better paints and coatings has increased the scope of these problems. Epoxies, phenolics and other synthetics that are very resistant to certain chemicals have complicated the stripping problems by requiring more extensive use of chlorinated hydrocarbons that are dangerous to use except under carefully controlled conditions.

These trends emphasize the need both for better training of personnel and more expensive equipment.

#### STEAM CLEANING AND OTHER METHODS FOR INTERIORS AND EXTERIORS OF WOOD AND MASONRY BUILDINGS AND EQUIPMENT

Steam cleaning is generally used to remove heavy soil from large pieces of equipment not easy to clean by soaking, spraying, or wiping methods. Grime and dirt deposited on top of existing paint can be easily removed by the combined action of high temperature and high velocity of wet steam. Grease and oil are easily removed with alkaline or emulsion cleaners and high pressure steam.

Chemical cleaners used in steam cleaning are usually classified as mild alkaline and heavy duty alkaline cleaners. The mild alkaline cleaners are generally used to degrease aluminum, magnesium, and other soft metal surfaces. Typical chemicals formulated in these cleaners are sodium metasilicate, sodium sesquisilicate, sodium tetraphosphate, and Nacconal. Heavy duty alkaline cleaners are used extensively to remove grease, oil, dirt, etc., from machinery and automotive equipment. Typical chemicals formulated in these cleaners are caustic soda, soda ash, and trisodium phosphate.

The equipment generally used for steam cleaning consists of a portable steam generating unit. Operating steam pressures range from 50 to 200 psi, depending on the kind of soil. The average water consumption per nozzle is about 200 gallons per hour. Two types of nozzles are commonly used in steam cleaning. Fan nozzles are used for broad surfaces. Round nozzles are better for small, inaccessible areas.

In the cleaning operation, the surface to be cleaned is wetted first. The tip of the nozzle is kept within 6 inches of the surface; the operation is performed in about the same manner as the spray painting operation.

Recommended detergent concentrations at the nozzle are from 0.5 to 0.75 percent. Detergent concentrations of around 0.5 percent are preferred for removal of oil, while concentrations above 0.75 percent are used for removal of paint.

Steam cleaning finds extensive application in maintenance cleaning of machinery and automotive equipment. NAVSHIPS 250-342-1 and NAVWEPS 07-1-503 outline procedures for steam cleaning of machinery and equipment. NAVDOCKS TP-PW-30 and TM 5-615<sup>9</sup> set forth the procedure for steam cleaning of concrete and masonry surfaces. Table IV lists representative Government and commercial materials. The methods and materials used for steam cleaning in commercial practice were found to be very similar to those used by the Government.

Wooden buildings are not steam cleaned; the general practice is to brush, scrape, or wipe clean and to remove soil with ordinary mineral spirits. Masonry exteriors may also commonly be cleaned by methods other than steam cleaning. Salt buffered hydrofluoric acid is available from commercial or GSA sources for this purpose. Sand blasting, wire brushing, and hydrochloric acid are also methods with specific building cleaning purposes.

#### METAL CLEANING

Metal cleaning for removal of grease, scale and rust is an industrial process with many variations. NAVDOCKS TP-PW-30 uses specification MIL-C-490A as the basic guide to metal cleaning for zinc coated and ferrous surfaces, and specification MIL-M-3171A as the basic guide to cleaning magnesium alloys. NAVSHIPS 250-342-1 and NAVWEPS 07-1-503 give materials and procedures for these and other metal cleaning problems. Table V lists a large number of specification compounds available for various jobs.

MIL-C-490A is essentially a performance specification and uses the water break test for inspection of grease removal and rinse water pH tests for inspection of alkali rinse. Three categories of chemical cleaning are allowed for cleaning to bare metal: hot alkaline methods, solvent cleaning methods, and solvent-emulsion methods. Two additional methods that leave a light phosphate coating are also included. MIL-M-3171A is much more detailed in the cleaning methods it requires.



The manuals and specifications just described appear to be quite consistent with normal commercial and industrial practice indicated in References 10 through 14, which are believed to represent the current technology in this field.

Although the basic techniques of metal cleaning are well established, there are a number of innovations reported that BUDOCKS field activities may find useful. These are discussed in the following paragraphs.

#### High Quality Cleaning

Increasing use of stainless steel and other corrosion resistant alloys in high quality application has created a need for new cleaners. Organic acids, such as citric acid, are finding considerable use on stainless steels, since even inhibited hydrochloric acid attacks the stainless steel surface. Fluorocarbon solvents such as the compound covered by specification MIL-C-8638, "Cleaning Compound Oxygen System," are used where extreme cleanliness is required in delicate mechanical and electronic assemblies. They may also be used where a nonflammable, low toxicity solvent is required. Because of their volatility, special cleaning cabinets are required.

#### Foam Solvent Method

Cleaning the inside of tanks or large containers is now sometimes done with a foam-solvent method developed by the Dow Chemical Company.<sup>15</sup> A surfactant-solvent foam is generated and pumped into the tank until it overflows. The overflow foam is captured, liquified, filtered, and then pumped back into the tank as a foam. Circulation is continued until cleaning is complete. This technique uses relatively small quantities of solvent, penetrates to small corners, and can be used on large containers that are not strong enough to be filled with liquid solvent.

#### Spray Cleaning

High pressure spray rigs are becoming commonly used and displace steam cleaning or dip tanks. A hot or cold alkaline-detergent solution is usually used. Items too large for the available dip tank can be handled and the inherent problems of steam boilers are avoided.

#### Improved Additives

Although the action of most cleaners is based on a few relatively simple chemicals, the additives used to improve the chemical action can make an important change in effectiveness. It is in this area that the special "trade secret" ingredients usually fall. Among these are: gluconic acid-a chelating agent, "Versene" type sequestrants,

glassy phosphates that permit strong alkaline action at relatively low pH's, amphoteric surface active agents that give changing characteristics at different pH's, and non-ionic surface active agents that give good detergency without foam for spray cleaners and agitated tanks.

#### PRE-PAINT CLEANING

Pre-paint cleaning requires removal of all rust, scale, loose dirt, dust, grease, and loose paint if surface is already painted. There is considerable overlap between this category and the previously covered sections on paint stripping and metal cleaning. The main point to distinguish pre-paint cleaning from stripping and metal cleaning is whether or not the basic material to be painted already has a surface that would be suitable for painting if it were free of grease and dirt. If the surface is covered with unsatisfactory paint or is a previously unpainted surface covered with metal oxide, it must then be handled by stripping or metal cleaning methods. If it is a basically sound surface, simpler cleaning methods can be used that will remove grease and dirt without damaging the already available painting surface.

Table VI lists the methods given in MO-110 for cleaning sound but dirty surfaces. The basic approach is use of a solvent or detergent cleaner, except for masonry or ferrous materials. This removes the dirt and grease. Sanding to roughen the surface is used, as necessary. Care of workmanship is probably the essential factor in these cleaning and preparation steps.

Old painted ferrous surfaces present perennial problems in pre-paint cleaning on objects that cannot be stripped, cleaned and phosphated. Spot removal of rust, followed by phosphate priming serve well on some subjects, but materials with cracks and pits are not likely to turn out well. The basic procedure for cleaning painted ferrous materials at stations visited consisted of steam cleaning, spot sanding, and priming, and a solvent wipe. If an ambulance or other vehicle that had been polished with silicones was to be painted, special solvent (indicated in Table V) was used at one station.

The Navy manuals and specification materials available seem to be up-to-date and adequate in this field.

#### SANITARY CLEANING

The information gathered in Technical Note N-580 indicated that existing Navy publications and available specification compounds did not recognize the rather widespread use of chlorinated phenol or quaternary ammonia detergent-sanitizers, and consideration was given to methods of developing the necessary information concerning these

items for increased use of them. An almost indefinite number of compound combinations is possible and measurement of resulting efficiencies is a rather extensive and expensive program. Discussion of this problem with several Government agencies indicated that conclusive information on efficiency can only be obtained by routine use of the compound in a regular cleaning program.

Technical Note N-580 also indicated that the BUDOCKS manual in this field, NAVDOCKS MO-125, should be updated.

To obtain the necessary information on detergent-sanitizers, a program of monitoring General Services Administration and Post Office Department work with these compounds was recommended.

#### COMMERCIAL CLEANERS AT NAVY FACILITIES

Despite the fact that various Navy publications indicate specification chemical cleaning methods and materials for practically all purposes, it was found that a number of bases prefer and use commercial products, particularly for smaller, non-routine jobs. A list of such products used at one station is shown in Table VII. Some of these are qualified products that meet specifications, but they are used mainly because of sales efforts by the company rather than because they are specification compounds. Where a relatively large amount of cleaning is being done, specification methods and standards were found to be in general use.

Procurement regulations do permit one time purchase of various non-specification items through commercial sources if the cost does not exceed \$2500. This gives local activities valuable leeway in buying and trying new products. This feature seems particularly necessary where a relatively small amount of chemical cleaning is done. The personnel involved are not likely to have the background experience and training in selecting materials and methods, so they depend more on sales and technical personnel from commercial organizations to meet cleaning problems as they arise.

#### CLEANING COSTS

In reviewing the available information on chemical cleaning, it was found that information on costs was very scarce. A 1955 report by a committee of the American Society for Metals<sup>16</sup> presents several comparisons for methods, but cautions against any generalizations. Many cost factors vary at different localities. Freight charges, labor, water, and waste disposal problems all have a heavy influence on cleaning costs. Effective use of facilities is an important factor. One

station visited had an excellent setup for hot alkaline cleaning, but used it infrequently because of excessive capacity. Unit costs were undoubtedly high for this cleaning setup.

In view of the variation in cost factors, it is not considered practical to attempt to generalize on method costs. The difficulty in selecting cleaning methods on the basis of cost and effectiveness is also reflected in specification MIL-C-490A. This specification judges cleaning methods almost entirely on the basis of end results because so many methods and materials are in use by different manufacturers.

#### DISCUSSION

In reviewing the various aspects of chemical cleaning to discover new, more effective methods not yet in use by BUDOCKS field activities, it was found that the most serious problem in keeping cleaning methods up-to-date is the lack of an effective method of evaluating new cleaners and disseminating information on them to the people doing the job. Although the rate of progress in the field does not seem to be particularly great, there is a steady increase in the number and types of jobs to be done. There is also considerable confusion generated by new commercial cleaners making new claims about the same old ingredients. Consequently, when a new or non-routine problem arises at a station, the cleaning foreman, who is not likely to be technically trained in this field, finds the selection of method and chemical a difficult problem. Available information on specification materials and methods is scattered in several Navy manuals and the required materials may not be stocked at a reasonably close supply depot.

The following conclusions and recommendations are made to improve and consolidate the technical information available to field stations and to provide for a continuing program of evaluating and disseminating information to them.

#### CONCLUSIONS

1. Detergent-sanitizers appear to be a major advance in sanitary cleaning and are not provided for in NAVDOCKS MO-125.
2. Alkaline spray cleaning is a widely useful metal cleaning method not covered by Navy manuals or specifications.
3. Information on many currently used Government cleaning methods and materials is not readily available to BUDOCKS field activities because of the lack of a consolidated, comprehensive BUDOCKS chemical cleaning manual.

4. The rate of progress in the chemical cleaning field appears to justify a moderate program under BUDOCKS for continuous collection and dissemination of technical information on chemical cleaning.

#### RECOMMENDATIONS

1. NAVDOCKS MO-125 should be expanded to parallel AFM 85-10 and include use of detergent-sanitizers if results from the General Services Administration and Post Office Department tests are favorable. The availability of pertinent compounds from GSA should also be shown in MO-125. (Repeated from Technical Note N-580.)
2. A detailed investigation of alkaline spray cleaning should be undertaken at NCEL during FY-65, along with monitoring the detergent-sanitizer tests mentioned in (1) just above.
3. In order to establish a continuing program in chemical cleaning and to consolidate available information, the following steps should be taken:
  - a. BUDOCKS (or NCEL) should arrange to participate in the activities of one of the established cleaning laboratories, such as the Navy Aeronautical Materials Laboratory, to have best access to current information on cleaning materials.
  - b. A cleaning manual similar to NAVSHIPS 250-342-1 (but more extensive) should be published by BUDOCKS for use at its field activities and should cover all chemical cleaning except sanitary cleaning.
  - c. A chemical cleaning specialist should be on the staff of BUDOCKS to routinely visit all shore establishments to give consultation and assistance to local activities, and to assemble information on Navy-wide cleaning problems as they develop. To some extent, he should act as a "sales engineer" for specification methods and compounds.

## REFERENCES

1. U. S. Naval Civil Engineering Laboratory. Technical Note N-580: Chemical cleaning materials and processes, by C. Saturnino. Port Hueneme, California, March 1964.
2. Bureau of Yards and Docks. NAVDOCKS TP-PW-30: Maintenance and operation of Public Works and Public Utilities, 1953.
3. Bureau of Yards and Docks. NAVDOCKS MO-110: Building maintenance; painting. 1963.
4. Bureau of Yards and Docks. NAVDOCKS MO-125: Building custodial maintenance. Washington, D. C., April 1963.
5. Department of the Army. NAVEXOS P-938-TM-38-230: Preservation, packaging and packing of military supplies and equipment. 1957.
6. Navy Department, Bureau of Ships. NAVSHIPS 250-342: Handbook of cleaning practices. Washington, D. C., 1957.
7. Navy Department, Bureau of Weapons. NAVWEPS 07-1-503: Chemical materials for naval weapons systems-maintenance and overhaul operations. Washington, D. C., February 1962.
8. General Services Administration. GSA-FSS Stores Stock Catalogue, September 1963.
9. U. S. Department of the Army. TM-5-615: Concrete and masonry, repairs and utilities. 1946.
10. Oakite Products Inc. F. 1064-6R2, "Metal cleaning and surface treatments," 1962.
11. Donald Price. "Industrial metal cleaners," in Soap and Chemical Specialties, 49-50, January 1961.
12. Turco Products, Inc. A-33-E-10M ZEN361, "Chemical processing compounds for the metal working industry." California, 1961.
13. J. B. Mohler. "Basic make-ups--alkaline solutions: what to use for effective cleaning," in The Iron Age, 59-62, July 1955.
14. P. C. Bardin. "Cleaning and treating metals to be painted," in Industrial Finishing, May, June, 1957.
15. A. R. Aidun, et al. "Novel uses for aqueous foams," in Chemical Engineering, 17 February 1964, 71:145.
16. ASM Committee on cost of metal cleaning, metal progress. "Metal cleaning costs." 15 August 1955, p. 169-173.

Table I. Government Agencies

1. Department of Health, Education, and Welfare  
Food and Drug Administration  
Washington, D. C.
2. United States Department of Agriculture  
Washington 25, D. C.
3. General Services Administration  
Federal Supply Service  
Washington 25, D. C.
4. Bureau of Facilities, Real Estate Division  
Post Office Department  
Washington 25, D. C.
5. U. S. Army Coating and Chemical Laboratory  
Aberdeen Proving Ground, Maryland
6. Wright-Patterson Air Force Base  
Dayton, Ohio
7. Bureau of Ships, Navy Department  
Washington 25, D. C.
8. Bureau of Naval Weapons, Navy Department  
Washington 25, D. C.
9. U. S. Naval Supply Center  
Research and Development Facility  
Bayonne, New Jersey
10. U. S. Navy Aeronautical Materials Laboratory  
Naval Air Material Center  
Philadelphia, Pennsylvania
11. Bureau of Yards and Docks Specification Center  
U. S. Naval Construction Battalion Center  
Davisville, Rhode Island
12. General Services Administration-FSA Region Three  
Chemicals, Subsistence and Drugs Branch  
Washington, D. C.

Table II. Commercial Chemical Cleaner Companies

1. Diamond Alkali Company  
300 Union Commerce Building  
Cleveland 14, Ohio
2. Oakite Products, Inc.  
46A Rector Street  
New York, New York
3. Pennsalt Chemicals Corporation  
3 Penn Center  
Philadelphia 2, Pennsylvania
4. Wyandotte Chemicals Corporation  
J. B. Ford Division  
Wyandotte, Michigan
5. Turco Products, Inc.  
6135 South Central Avenue  
Los Angeles 1, California
6. Dearborn Chemical Company  
Merchandise Mart Plaza  
Chicago 54, Illinois
7. E. I. du Pont de Nemours & Co.  
Wilmington 98, Delaware
8. Du Bois Company  
630 Broadway  
Cincinnati 2, Ohio
9. Economics Laboratory, Inc.  
Guardian Building  
St. Paul 1, Minnesota
10. Dow Chemical Company  
Midland, Michigan
11. Nalco Chemical Company  
6216 West 66th Place  
Chicago 68, Illinois
12. Charles Pfizer and Company  
630 Flushing Avenue  
Brooklyn 6, New York
13. Monsanto Chemical Company  
800 North Lindberg Boulevard  
St. Louis 66, Missouri



Table III. Paint Strippers for Wood and Metal

<u>Title</u>	<u>Specification Number</u>
Remover - fluorescent paint - water-rinsable	MIL-R-21972
Remover - paint - alkali type for hot application	TT-R-230A
Remover - paint - alkali type	TT-R-230
Remover - paint - alkali type	P-R-191
Remover - paint - organic solvent	TT-R-251D
Remover - paint and varnish - alkali-organic-solvent	MIL-R-12294A-2
Remover - paint and varnish - silicate type	MIL-R-7751A-1
Remover - paint and varnish - alkali-organic solvent	MS-35616
Remover - paint and varnish - nonflammable	MS-35617
Remover - paint and lacquer - solvent type (supersedes 14-119)	MIL-R-25134A-2
Remover - paint - nonflammable - water-rinsable	MIL-R-8633A-4
Remover - paint - nonflammable - water-rinsable - usable in contact with synthetic rubber	MIL-R-18553A
Remover - paint - water-rinsable - temporary fluorescent finish stripping	MIL-R-21972A
Stripper - paint - from steel or anodized aluminum	MIL-R-7751
Remover - paint, dirt and grease from ferrous surfaces	MIL-S-6892

Table IV. Cleaners for Equipment and Buildings

<u>Title</u>	<u>Specification Number</u>
Cleaning compound - high pressure - steam cleaner	P-C-437
Cleaning compound - liquid - high pressure cleaner	MIL-C-22542
Cleaning compound - steam	P-S-751
Solvent - cleaning - high temperature pressure spray	MIL-S-10561
Cleaning compound - hydrofluoric acid - salt base - light-duty - masonry	Stock 7930-253-5812

Table V. Metal Cleaning Compounds for Degreasing

<u>Title</u>	<u>Specification Number</u>
Cleaning compound - synthetic detergent - non-abrasive	P-C-00431B
Cleaning compound - synthetic detergent - non-abrasive	FED-STD-126
Cleaning compound - synthetic detergent - non-abrasive - all purpose (supersedes P-D-236 in part)	P-C-431A
Cleaning compound - water emulsion	MIL-C-22543A
Cleaning compound - emulsion type	MIL-C-25179A
Cleaning and protecting interior non-machined surfaces of castings and weldments	MIL-C-19052
Cleaning compound - alkali type	P-C-436A
Cleaning compound - aluminum surface - non-flame - sustaining	MIL-C-5410B-1
Cleaning compound - degreasing and depreserving solvent - self-emulsifying	MIL-C-11090B-1
Cleaning compound - engine - sprayable	MIL-C-7753-1
Cleaning compound - grease emulsifying	P-C-444
Cleaning compound - solvent - grease removal - heavy duty	MIL-C-20207C
Cleaner - grease remover solvent	Stock No. 7930-50-6399
Cleaning compound - solvent - grease emulsifying	P-C-00576B
Cleaning compound - aircraft surface - liquid form - sprayable	Part No. T-734
Detergent - general purpose - liquid	Part No. A-33

Table V. Metal Cleaning Compounds for Degreasing (Cont'd)

<u>Title</u>	<u>Specification Number</u>
Detergent - general purpose - liquid - oil soluble - nonflammable - for asphalt, concrete, steel	Part No. CA-1
Detergent - general purpose - liquid - powder - flake - water soluble	P-D-220
Detergent - general purpose - oil soluble - water soluble	MIL-D-16791
Detergent - general purpose - powder - water soluble	MIL-D-26937
Soap - automobile and floor - liquid and paste	P-S-560
Soap - scouring - cake form	P-S-571C
Soap - potash - linseed oil - liquid and paste - floor and general cleaning	P-S-603B
Solvent-emulsifier - oil slick	MIL-S-22864
Solvent - cleaner - cold	MIL-S-18718
Solvent - cleaner - engines	
Solvent - tetrachloroethylene	O-P-191A
Solvent - 1 - 1 - 1 - trichloroethane	O-T-620A
Carbon - removing compound - orthodichlorobenzene	MIL-C-25107A
Carbon - removing compound	MIL-C-19853
Carbon - remover - hot immersion type - cresol base	MIL-C-5546A
Carbon - removing compound	P-C-111A
Carbon tetrachloride - technical	O-C-141A
Acetone - technical	O-A-51
Hydrochloric acid - technical	O-A-86

Table V. Metal Cleaning Compounds for Degreasing (Cont'd)

<u>Title</u>	<u>Specification Number</u>
Sulfuric acid - technical	O-A-115
Oxalic acid - technical	O-A-91
Sodium hydroxide - technical	P-S-631
Calcium hypochlorite - technical	O-C-114A
Sodium bicarbonate - technical	O-S-576A
Sodium carbonate - technical	O-S-571E
Sodium carbonate - bicarbonate mixture	P-S-641F
Sodium hypochlorite solution	O-S-602B
Sodium metasilicate - technical	O-S-604B
Sodium orthosilicate - technical	P-S-651C
Sodium phosphate - technical	O-S-642B
Sodium polyphosphate - glassy	O-S-635B
Trisodium phosphate - technical	O-T-671

Cleaning Job Surface	Kind of Soil	Cleaning Compositions	Applicable Specifications	Methods/Remarks
Iron Steel	Oil Grease Dirt	Solvent Hot alkaline Emulsion	TT-C-490 (Method II, III or IV)	The selection of the method depends on the size of the surface to be cleaned.
Aluminum Aluminum alloys	Oil Grease	Solvent	MIL-T-704D	After degreasing with a solvent, the surface is immersed for 3-5 minutes in a 10% solution of chromic acid, after which the surface is rinsed with warm water.
Zinc-coated surfaces	Oil Grease	Solvent		
Magnesium alloys	Oil Grease	Solvent	MIL-M-3171 (Type III)	When dip treatment is required, the surface is cleaned in accordance with MILSPEC MIL-M-3171, Type III.
Copper Brass Bronze	Oil Grease	Solvent		
Concrete Masonry Painted surfaces	Dirt Fungi Efflorescence detergent Oil Grease	TSP Non-saponifying detergent Muriatic acid Solvent		Oil, grease, dirt and fungus can be removed with TSP, detergent or solvent. Efflorescence is removed with muriatic acid.
Plaster Wallboard	Dust Dirt Oil	TSP Solvent		Unpainted surfaces should not be wetted excessively.
Wood	Dust Dirt Oil	Soap Solvent		Unpainted surfaces should not be wetted excessively.

Table VI. Prepaint Cleaners and Methods for Bare and Old Painted Surfaces

Brand	Type	Application	Method of Application	Manufacturer	Approximate Price
Speedomatic	Methylene chloride	Removes paint, varnish, shellac, lacquer, enamel	Brush	Jasco Chemical Corporation	\$ 2.50 gal.
Silicone Film Remover #6384	Organic solvent	Removes silicone polish from old lacquer or enamel finishes	Brush	Martin-Senour Company	1.90 gal.
Oakite #131		Rust remover	Brush		.54 lb.
Crysoat		Rust preventive			.31 lb.
Ion Kote		Rust preventive			
Del Chem 666-D	Alkaline	Paint stripper	Steam cleaning	Pennsalt Chemicals Corporation	.50 lb.
Reducto	Synthetic solvent	Cleaning of metal and other surfaces prior to painting	Spray	H. Forsberg Co.	
Soilax SC-500	Alkaline	Grease, oil, mud removal	High pressure steam cleaner	Economics Laboratories, Inc.	.22 lb.
Pennchem 666-D	Alkaline	Grease, oil, mud removal	High pressure steam cleaner	Pennsalt Chemicals Corporation	.14 lb.

Note: The items listed above represent only proprietary cleaners used mainly for heavy equipment maintenance. Other chemicals, such as sulfuric acid, etc., are also used.

Table VII. Proprietary Cleaners Used at One Naval Base